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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/063,104	03/21/2002	Charles Adrian Becker	RD-29430	3459

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GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH
PATENT DOCKET RM. BLDG. K1-4A59
NISKAYUNA, NY 12309

EXAMINER

PATEL, ISHWARBHAI B

ART UNIT	PAPER NUMBER
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2841

DATE MAILED: 07/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/063,104

Applicant(s)

BECKER ET AL.

Examiner

Ishwar (I. B.) Patel

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 March 2005 and 29 September 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-59 is/are pending in the application.
- 4a) Of the above claim(s) 1-59 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 March 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. This action is in response to "response to notice of non-compliant amendment" filed on March 10, 2005 and amendment filed on September 29, 2004.

Election/Restrictions

2. The newly added claims 58 and 59, with the limitation of second flexible interconnect structure, is not reading on the elected specie. Therefore, both the claims 58 and 59 are withdrawn from further consideration.

Claim Objections

3. Claim 13 is objected to because of the following: Claim 13 is directly depending upon claim 1. Claim 1 has a limitation "said at least a heat sink covering said at least a removed portion and **less that an entire surface** of said flexible dielectric film". Claim 13, which depends from claim 1, has a limitation "said body (said heat sink body) covering **substantially an entire surface** of said dielectric film opposite to a surface on which circuit traces are disposed". These two limitations in one claim (claim 13) are misleading. May be one of them can be deleted. Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1 - 7, 12 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Eichelberger et al., US Patent No. 5,452,182.

Regarding claim 1, Eichelberger et al., in figure 1, discloses a flexible interconnect structure comprising: a first flexible dielectric film (32) having two opposed surfaces (upper and lower surfaces), at least a portion of said dielectric film being removed (dielectric film removed for the via holes, column 8, line 12-16) through a thickness thereof, forming at least a removed portion (via holes); circuit traces (35) disposed on at least one of said surfaces (column 8, line 12-13), and at least a heat sink (14) being attached to a surface of said dielectric film, said at least a heat sink covering said at least a removed portion (covering the area around the via hole, see figure 1) and less than an entire surface of said flexible dielectric film (covering only part of the film 32, see figure 1).

Regarding the limitation “said flexible interconnect structure being capable of being bent to a shape that has a radius of curvature of less than about 10 cm”, the language capable of being bent” require the interconnect structure to be able to be bent.

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The interconnect structure of Eichelberger et al., is flexible (see figure 1 and abstract), therefore the structure of Eichelberger et al., meets the limitation. Further, it has been held that the recitation that an element is "capable of" is not a positive limitation but only require the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchison*, 69 USPQ 138.

Regarding claim 2, Eichelberger et al., further discloses a flexible material that provide isolation across a thickness of said dielectric film, said material being polyimide (column 7, line 57-64).

Regarding claim 3, Eichelberger et al., further discloses said dielectric film with a thickness in a range from 12.5 to 75 micrometer, which is within the claimed range 1 micrometer to about 5 mm (column 2, line 20-25, which is disclosed by reference, column 10, line 29-45).

Regarding claim 4, Eichelberger et al., further discloses one electrical component, integrated circuits (20).

Regarding claim 5, Eichelberger et al., further discloses a dielectric protective layer disposed to cover said circuit traces (layer 36) and electrical circuits (column 2, line 9-12).

Regarding claim 6, Eichelberger et al., further discloses at least a heat sink comprises a thermally conductive material (14, made of Alumina or another electrically insulating thermally conducting material, column 7, line 54-56).

Regarding claim 7, Eichelberger et al., further discloses said thermally conductive material is ceramic (14, made of Alumina or another electrically insulating thermally conducting material, column 7, line 54-56).

Regarding claim 12, Eichelberger et al., further discloses said at least a heat sink covers a plurality of said removed portions (heat sink covering via holes, only one shown in the figure, column 8, line 12-20).

Regarding claim 13, Eichelberger et al., further discloses said at least a heat sink comprises a body made of a material selected from the group consisting of metals and ceramics (14, made of Alumina or another electrically insulating thermally conducting material, column 7, line 54-56), said body covering substantially an entire surface of said dielectric film opposite to a surface on which circuit traces are disposed (see figure 1). It is to be noted here that substantially is considered as not fully.

6. Claims 1-4,6,7,12 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Kirby, US Patent No. 4,563,725.

Regarding claim 1, Kirby, in figure 1, discloses a first flexible dielectric film (insulating laminate 1 of flexible polyimide, column 6, line 30-35) having two opposed surfaces (upper and lower), at least a portion of said dielectric film being removed through a thickness thereof, forming at least a removed portion (plurality of holes 15); circuit traces (conductive array 2) disposed on at least one of said surfaces, and at least a heat sink (heat sink pillar 17 with plate 16, figure 1) being attached to a surface of said dielectric film, said at least a heat sink covering said at least a removed portion (covering holes 15) and less than an entire surface of said flexible dielectric film (the heat sink does not cover the sides of the top surface of the dielectric substrates, see figure 1)

Regarding the limitation "said flexible interconnect structure being capable of being bent to a shape that has a radius of curvature of less than about 10 cm", the language capable of being bent" require the interconnect structure to be able to be bent. In the structure of Kirby, the laminate 1 is flexible and the heat plate 16 is made of aluminum alloy (column 6, line 60-62), which can be bent. Therefore, Kirby meets the limitation. Further, it has been held that the recitation that an element is "capable of" is not a positive limitation but only require the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchison*, 69 USPQ 138.

Regarding claim 2, Kirby further discloses said dielectric film made of polyimide (column 6, line 30-35).

Regarding claim 3, Kirby further discloses said dielectric film has a thickness of about 0.5 mm, which is within the range from about 1 micrometer to about 5 mm, (column 6, line 30-35).

Regarding claim 4, Kirby further discloses an integrated circuit as an electrical circuit component (column 6, line 45-49).

Regarding claim 6 and 7, Kirby further said at least a heat sink comprises a thermally conductive material selected from metal (thermally conductive plate 16 suitably of aluminum copper, beryllium copper or phosphor bronze, column 6, line 60-63).

Regarding claim 12, Kirby further discloses said at least a heat sink covers a plurality of said removed portions (plurality of holes 15, figure 1).

Regarding claim 13, Kirby further discloses said at least a heat sink comprises a body made of a material selected from the group consisting of metals (thermally conductive plate 16 suitably of aluminum copper, beryllium copper or phosphor bronze, column 6, line 60-63), said body covering substantially an entire surface of said dielectric film opposite to a surface on which circuit traces are disposed (plate 16, figure 1).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 8-11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Eichelberger et al., as applied to claim 1 above, and further in view of Azar, US Patent No. 5,920,458.

Regarding claim 8, Eichelberger et al., discloses all the features of the claimed invention as applied to claim 1 above, including the heat sink, but fails to disclose heat sink with fins.

Azar, in embodiment shown in figure 4, discloses a printed circuit board assembly with an enhance cooling of a heat dissipating circuit element, with a heat sink having fins (32, figure 4) for enhancing the heat dissipation.

A person of ordinary skill at the time of applicant's claims invention would have recognized the advantage of providing fins to the heat sink in order to enhance the heat dissipation rate.

Therefore, it would have been obvious to a person of ordinary skill in the at the time of applicant's invention to provide the assembly of Eichelberger et al., with the heat sink having fins, as taught by Azar, in order to enhance the heat dissipation rate.

Regarding claim 9-11 discloses all the features of the claimed invention as applied to claim 1 above, including the heat sink, but fails to disclose said heat sink comprise heat pipes to carry heat away from an electrical component disposed thereon, as claimed in claim 9, said heat sink comprises a mechanism for active cooling, as claimed in claim 10 and said active cooling is effected by a mechanism selected from forced cooling or refrigeration, as claimed in claim 11.

Azar, in another embodiment (figure 5), further discloses the heat dissipation member comprises a hollow core heat exchanger 36. A flow controller 38, which may be refrigerator-type device, in fluid communication with a through bore 39 of the heat exchanger 36. Either liquid or air can be utilized as a coolant and the flow controller 38 effects the passage of such coolant through the through bore 39 of the heat exchanger 36, column 3, line 35-43, for further enhancing the heat dissipation rate.

A person of ordinary skill at the time of applicant's claims invention would have recognized the advantage of providing such elements to enhance the heat dissipation rate.

Therefore, it would have been obvious to a person of ordinary skill in the at the time of applicant's invention to provide the assembly of Eichelberger et al., with said heat sink comprising heat pipes to carry heat away from an electrical component disposed thereon, as claimed in claim 9, said heat sink comprising a mechanism for active cooling, as claimed in claim 10 and said active cooling is effected by a mechanism selected from forced cooling or refrigeration, as claimed in claim 11, as taught by Azar, in order to in order to enhance the heat dissipation rate.

9. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kirby as applied to claim 1 above, and further in view of Haley, US Patent No. 5,506,756 and Pastore et al., US Patent No. 5,285,352.

Regarding claim 5, the applicant is further claiming a dielectric protective layer disposed to cover said electrical circuit component and circuit traces. Kirby fails to disclose such protective layer.

Haley discloses a package with an integrated circuit mounted on the flexible circuit board with a housing, preferably injection molded plastic material covering the integrated circuit and the traces, providing enough stiffness to structurally support the component and the circuit board, column 2, line 40-45 and column 3, line 43-46, figure 1 and 5.

Pastore et al., discloses a semiconductor device with the die and portion of the substrate encapsulated in a conventional epoxy resin package.

As disclosed by Haley and Pastore, it is well known in the art to provide a protective cover to the component and the substrate to encapsulate for protection against environmental and other damage and to provide necessary stiffness.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to provide the assembly of Kirby with a protective layer, from the teachings of Haley and Pastore et al., in order to encapsulate the component and the substrate to have a protection against environmental and other damage and to provide necessary stiffness to the assembly.

10. Claims 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kirby, as applied to claim 1 above, and further in view of Azar, US Patent No. 5,920,458.

Regarding claim 8, the applicant is further claiming at least heat sink has fins extending away from said dielectric film.

Kirby fails to disclose such fins to the heat sink.

Azar, in embodiment shown in figure 4, discloses a printed circuit board assembly with an enhance cooling of a heat dissipating circuit element, with a heat sink having fins (32, figure 4) for enhancing the heat dissipation.

A person of ordinary skill at the time of applicant's claims invention would have recognized the advantage of providing fins to the heat sink in order to enhance the heat dissipation rate.

Therefore, it would have been obvious to a person of ordinary skill in the at the time of applicant's invention to provide the assembly of Kirby with the heat sink having fins, as taught by Azar, in order to in order to enhance the heat dissipation rate.

Regarding claim 9-11, the applicant is further claiming said heat sink
Comprise heat pipes to carry heat away from an electrical component disposed thereon, as claimed in claim 9, said heat sink comprises a mechanism for active cooling, as claimed in claim 10 and said active cooling is effected by a mechanism selected from forced cooling or refrigeration.

Kirby does not disclose such limitations.

Azar, in another embodiment (figure 5), further discloses the heat dissipation member comprises a hollow core heat exchanger 36. A flow controller 38, which may be refrigerator-type device, in fluid communication with a through bore 39 of the heat exchanger 36. Either liquid or air can be utilized as a coolant and the flow controller 38 effects the passage of such coolant through the through bore 39 of the heat exchanger 36, column 3, line 35-43, for further enhancing the heat dissipation rate.

A person of ordinary skill at the time of applicant's claims invention would have recognized the advantage of providing such elements to enhance the heat dissipation rate.

Therefore, it would have been obvious to a person of ordinary skill in the at the time of applicant's invention to provide the assembly of Kirby with said heat sink comprising heat pipes to carry heat away from an electrical component disposed thereon, as claimed in claim 9, said heat sink comprising a mechanism for active cooling, as claimed in claim 10 and said active cooling is effected by a mechanism selected from forced cooling or refrigeration, as taught by Azar, in order to in order to enhance the heat dissipation rate.

Response to Arguments

11. Applicant's arguments with respect to claims 1-13 have been considered but are moot in view of the new ground(s) and explanation of rejection.

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

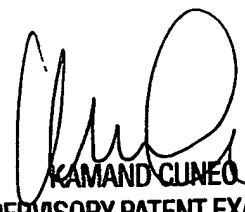
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ishwar (I. B.) Patel whose telephone number is (571) 272 1933. The examiner can normally be reached on M-F (8:30 - 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo can be reached on (571) 272 1957. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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June 25, 2005



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